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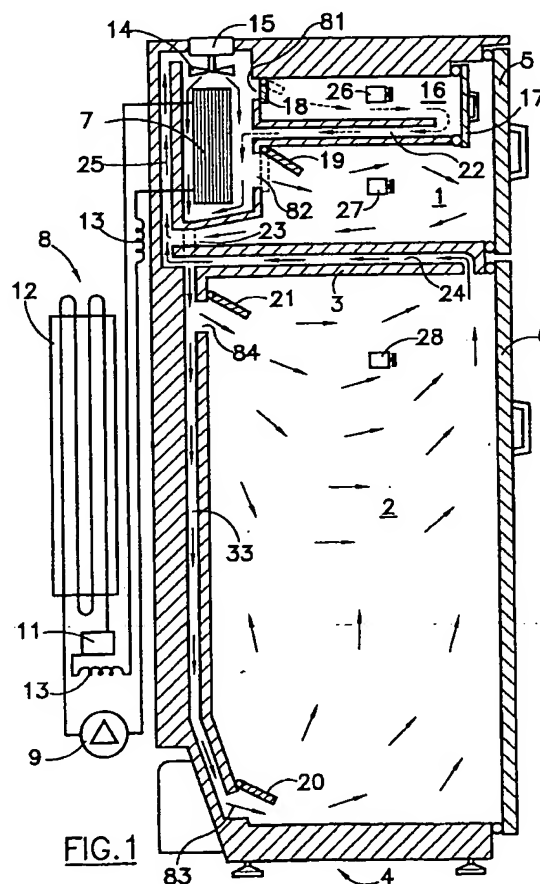
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(54) **Refrigerator with compartment for the quick cooling of food**

(57) Home refrigerator comprising at least one freezer compartment (1) and at least one compartment (2; 2, 50) at a temperature higher than the freezer compartment (1) and comprising a refrigeration circuit (8) with relative condenser (12), compressor (9), evaporator (7) and fan (14). Such refrigerator comprises at least one small size compartment (16) that gets cold quickly by means of a circulation of air that is forced by the fan (14) through the evaporator (7) and inside said at least one small size compartment (16) and said at least one compartment (2; 2, 50) at a temperature higher than the freezer compartment (1) by means of opportune inlet openings (81, 83-84; 81, 83; 81, 83-51) whose closing and opening is controlled by valve means (18, 20-21; 18, 20; 18, 20-52) that are controlled thermostatically.



## Description

[0001] The present invention refers to a refrigerator with compartment for the quick cooling of the food, more in particular to a refrigerator for home use.

[0002] Current refrigerators for home use normally comprise at least two compartments at a different temperature, one at higher temperature (typically between + 3°C and +6°C) for fresh food and the other at lower temperature (typically - 18°C) for frozen and deep frozen food. Each one of the two compartments is provided with a respective evaporator, or with a respective portion of a same evaporator, that is part of an ordinary refrigeration circuit with compressor and condenser.

[0003] These refrigerators are generally "no frost", that is equipped with means that are suitable to prevent the formation of frost on the wall of the evaporator. For such reason in the compartment with low temperature a so-called "ventilated" evaporator is provided, that is subject to forced air circulation.

[0004] During the stage of the food cooling each food, that has previously been cooked at a temperature higher than or equal to 90°C, begins to deteriorate irreversibly due to the quick proliferation of the bacteria present in the air and of the spores that survived the cooking. The temperature range inside which the maximum bacterial development takes place is comprised between + 70°C and + 3°C. The longer is the permanence in this zone, the higher is the alteration of the product and that happens when a food is let cool at room temperature and/ or in a normal refrigerator. In order to avoid that, blast chillers are used that allow to bring the temperature at the core of the food from + 70°C to + 3°C in 90 minutes. In this way it is possible to slow down the process of ageing of the product, that can be preserved in the refrigerator for 5/ 7 days.

[0005] In the same way, in order to assure the food that must be frozen that the initial quality does not get compromised in any way during the freezing stage, it is necessary that the latter takes place quickly. In fact with the quick freezing the food's liquids change into microcrystals that do not damage the tissue structure of the product in any way. To such purpose quick freezer are used that allow to bring the temperature at the core of the food from + 90°C to - 18°C in 240 minutes.

[0006] Both the blast chillers and the quick freezer are usually part of a single electrical appliance, and this electrical appliance is realised in a way separate from home refrigerators.

[0007] In view of the state of the art herein described, object of the present invention is to realise a refrigerator for home use that comprises at least one compartment for the quick cooling of the food.

[0008] According to the present invention, such object is attained by means of a refrigerator for home use comprising at least one freezer compartment and at least one compartment with temperature higher than said freezer compartment, comprising a refrigeration

circuit with relative condenser, compressor, evaporator and fan, characterized in that it comprises at least one compartment having small dimension that gets cold quickly by means of a forced air circulation from said fan through said evaporator and inside said at least one small dimension compartment and said at least one compartment with temperature higher than said freezer compartment by means of appropriate inlet openings whose closing and opening is controlled by valve means that are controlled thermostatically.

[0009] Owing to the present invention it is possible to realise a refrigerator for home use comprising at least one compartment that can serve as blast chiller and/ or as quick freezer

[0010] The characteristics and the advantages of the present invention will become evident from the following detailed description of some embodiments thereof, that are illustrated as a non limiting example in the enclosed drawings, in which:

Figure 1 shows, in vertical section, a "no frost" type refrigerator with a compartment for the quick cooling of the food that is stored inside a freezer, according to a first embodiment of the present invention;

Figure 2 shows an electric layout of the refrigerator in Figure 1;

Figure 3 shows a refrigerator similar to the one in Figure 1 but with a compartment for the quick cooling of the food stored inside a compartment of the refrigerator with temperature higher than the freezer;

Figure 4 shows a refrigerator similar to the one in Figure 1 but with a second compartment at a temperature higher than the freezer.

[0011] In Figures 1 and 3 there is shown a refrigerator having two compartments, respectively 1 and 2, respectively with lower (freezer) and with higher temperature that are separated by a horizontal dividing wall 3 inside a common cabinet 4. Such compartments are closed by respective independent doors 5 and 6.

[0012] Against the back wall of the freezer 1 an evaporator 7 that is part of a refrigerating circuit 8 is set that comprises a compressor 9, a filter 11, a condenser 12 and flow laminators 13.

[0013] A fan 14, that is cyclically operated by an appropriate electric motor 15 and placed on top of the evaporator 7, allows the circulation of air inside the refrigerator.

[0014] In Figure 1 inside the freezer 1 a smaller compartment 16 is housed that is provided with a door 17 which, by virtue of its size, allows a quick cooling of the food that is inserted inside it.

[0015] The compartments 16, 1, and 2 are provided with respective openings 81, 82, 83-84, that are controlled by respective plugs 18, 19, 20-21, that allow the inlet of the cold air that is made circulate by the fan 14, and

with respective ducts 22, 23 and 24 for the outflow of the air from the compartments. Both ducts 23 and 24 communicate with a single duct 25 that is provided in the upper and back part of the cabinet 4 and that is communicating with the fan 14 and with the evaporator 7.

[0016] The aforesaid compartments 16, 1 and 2 are provided with appropriate thermostats 26, 27, 28 that are suitable to control the opening and closing movement of the plugs 18, 19, 20-21 in such a way so as to adjust the temperature inside the compartments according to a predetermined temperature.

[0017] The correct operation of the refrigerator in Figure 1 is guaranteed by an appropriate electric circuit shown in figure 2. This comprises a pair of feed terminals 29 and 30, between which the motor 15 for the operation of the fan 14 is interposed. In addition, the thermostat 28 that controls the closing and the opening of the plugs 20 and 21, a block indicated by 31 and the motor of the compressor 9 are connected to the terminal 29. Such block 31 is made up of a manually operated switch 32, with two possible positions 34 and 35 in order to connect alternately and respectively to the thermostat 26 or to the thermostat 27 that control the plugs 18 and 19 respectively. The thermostat 26 is also provided with an sound alarm 100 that is activated when the temperature of the compartment 16 reaches + 3°C and it is also provided with a control that, when the thermostat 26 provides to the closing of the plug 18 once the temperature inside the compartment 16 reaches - 18°C, causes the switch 32 to move into the position 35.

[0018] The refrigerator operates with the following operative way.

[0019] During the normal operation of the refrigerator, with the switch 32 in position 35, the thermostat 27 is in closing position and so is the thermostat 28, therefore the compressor 9 is operating and it allows the evaporator 7 to subtract heat from the environment in which it is located. The plugs 19, 20-21 are opened in such a way that the air that is forcedly made circulate by the fan 14, after having reached the evaporator 7 and thus having cooled down, can enter the compartments 1 and 2 through the openings 82, 83-84 and can flow out from the respective ducts 23 and 24 and go back to the evaporator through the duct 25, as shown by the continuous line arrows in Figure 1. Such air circulation prevents the formation of frost. The plug 18 remains closed and therefore the quick freezing compartment 16 is not operating.

[0020] In order to make it operating it is necessary to operate on the switch 32 so as to move it in position 34. At this point the plug 19 gets closed while the thermostat 26 keeps the plug 18 in opening position. The result is an air circulation as the one indicated by the dotted line arrows in Figure 1. Because of the fan 14 the cold air flows through the opening 81 inside the compartment 16 and flows out from the same compartment through the duct 22. The opening 82 of the freezer remains closed by the plug 19 and therefore all the air

coming from the duct 22 and partly from the evaporator 7 flows through a vertical duct 33 and through the openings 83-84 it flows inside the compartment 2. The air inside the compartment 2 flows out toward the evaporator 7 from the same compartment through the ducts 24 and 25. Such air circulation prevents the formation of frost.

[0021] When the temperature of the compartment 16 reaches + 3°C, a sound alarm or of other kind 100 informs an operator that can take the food out of the compartment 16 totally, and in this case to interrupt the flow of air inside the compartment by operating on the switch 32 so as to move it in the position 35, or partially and leave that the temperature inside the compartment can reach - 18°C. Therefore the compartment 16 works both as a blast chiller as well as quick freezer.

[0022] The food taken out of the compartment 16 at a temperature of + 3°C is positioned inside the compartment 2 that is to this purpose brought to a temperature of + 3°C by the thermostat 28.

[0023] At the moment in which the temperature inside the compartment 16 reaches - 18°C the thermostat 26 provides to close the opening 81 with the plug 18 and an appropriate control operates on the switch 32 in order to move it into the position 35 in order to start the normal operation of the refrigerator.

[0024] A variation to the above described embodiment provides for the positioning of the compartment 16 inside the compartment 2 of the refrigerator, as it can be observed in Figure 3. In addition it provides for the use of a single opening 83, that is closed by a plug 20, for the flow of the air coming from the duct 33 and of a second duct 40 for the outflow of the air from inside the compartment 2 toward the duct 25. An appropriate plug 41 controls the opening or the closing of the duct 40 as a function of the temperature respectively of +6°C or + 3°C that is established. Inside the compartment 2 it is possible to insert a grid 10 in order to separate the lower part 42 of the compartment having a colder temperature from the upper part 43 having a higher temperature. Such lower part has the function to preserve the food coming from the compartment 16 when the latter works as blast chiller.

[0025] The correct operation of the refrigerator in Figure 3 is guaranteed by a suitable electric circuit that is similar to the electric circuit in Figure 2 but in which the thermostat 28 controls the opening and the closing of the plugs 20 and 41.

[0026] For the refrigerator in Figure 3 too it is necessary to consider the two alternative cases of operation of the compartment 16 with air flow as described by dotted line arrows in Figure 3, and alternative operation of the freezer 1 with flow of air as described by the continuous line arrows in Figure 3.

[0027] A second variation of the refrigerator of Figure 1 provides for the use of a second compartment 50 interposed between the freezer 1 and the compartment 2 that is provided with appropriate opening 51, and

respective plug 52, for the flow of the air inside the same compartment and of a duct 53 for the outflow of the air toward the duct 25, as it can be observed in Figure 4. In addition, the compartment 50 is provided with an appropriate thermostat 54 that is suitable to set the inside temperature at + 3°C and with an independent door 55. The compartment 50 has essentially the function to preserve the previously cooled food in the compartment 16 when the latter serves as blast chiller. Inside the compartment 2 a single opening 83 with plug 20 for the flow of the air inside the same is provided.

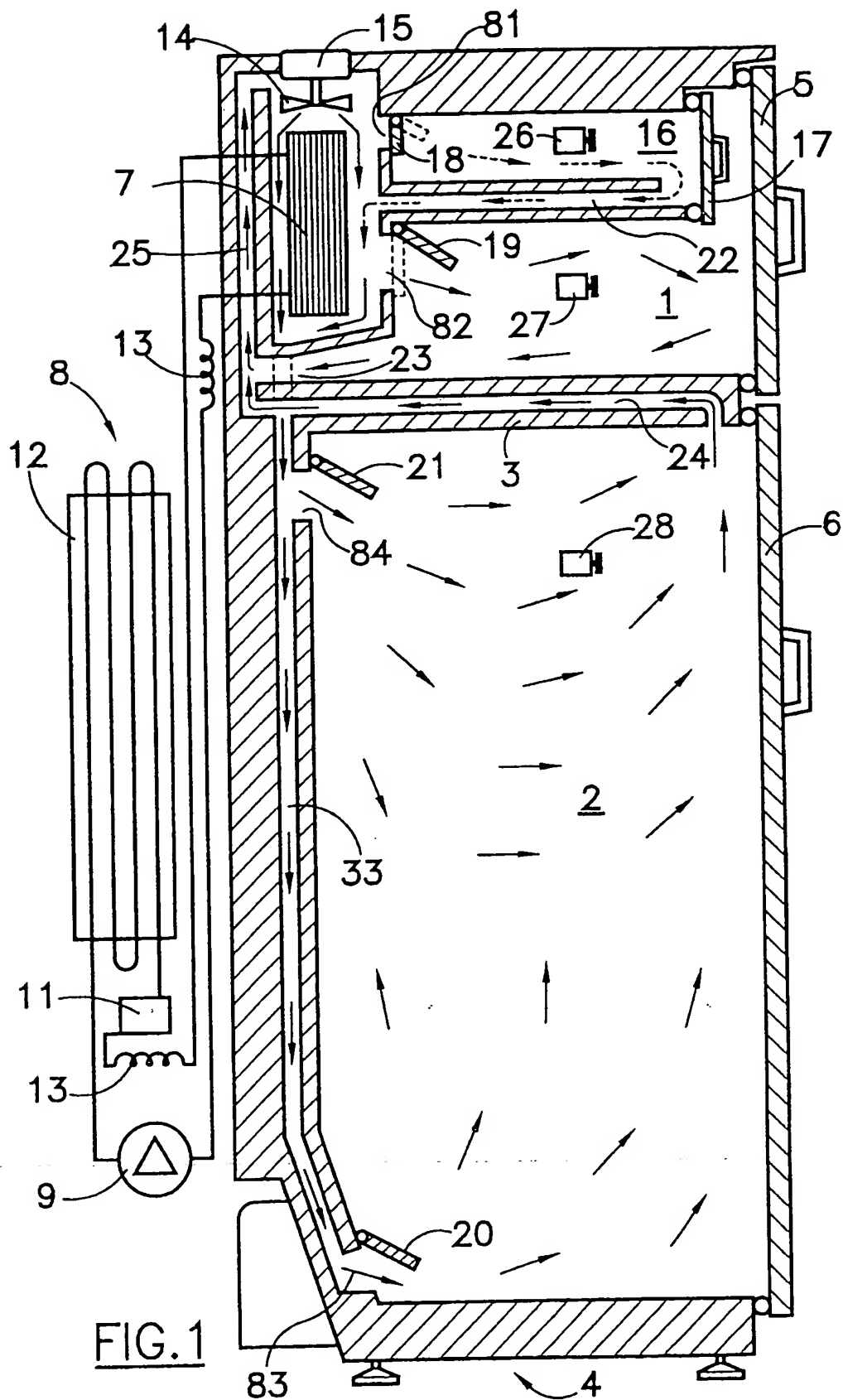
[0028] The correct operation of the refrigerator in Figure 4 is guaranteed by a suitable electric circuit that is similar to the circuit in Figure 2 but in which the thermostat 28 controls only the opening and the closing of the plug 20 while the thermostat 54 controls the opening and the closing of the plug 52.

[0029] For the refrigerator of Figure 4 too it is necessary consider the two alternative cases of operation of the compartment 16 with flow of air as described by the dotted line arrows in Figure 4, and alternative operation of the freezer 1 with flow of air as described by the continuous line arrows in Figure 4.

[0030] For a higher precision in the determination of the temperature of a food that is stored inside the compartment 16, it is possible to use a thermometer that is provided with rod probes to be positioned at the center of the same food.

#### Claims

1. Refrigerator for home use comprising at least one freezer compartment (1) and at least one compartment (2; 2, 50) at a temperature higher than said freezer compartment (1), comprising a refrigeration circuit (8) with relative condenser (12), compressor (9), evaporator (7) and fan (14), characterized in that it comprises at least one small size compartment (16) that gets cold quickly by means of an air circulation forced by said fan (14) through said evaporator (7) and inside said at least one small size compartment (16) and said at least one compartment (2; 2, 50) at a temperature higher than said freezer compartment (1) by means of opportune inlet openings (81, 83-84; 81, 83; 81, 83-51) whose closing and opening is controlled by valve means (18, 20-21; 18, 20; 18, 20-52) that are controlled thermostatically.
2. Refrigerator according to claim 1, characterized in that said at least one small size compartment (16) is provided with a first thermostat (26) that allows it to function as a blast chiller and as quick freezer
3. Refrigerator according to claim 2, characterized in that it comprises a second thermostat (27) that controls a valve means (19) that is suitable to control the opening and the closing of an opening (82) of said at least one freezer compartment (1) for the circulation of air inside thereof, said second thermostat (27) and said first thermostat (26) allowing said at least one freezer compartment (1) and said at least one small size compartment (16) to receive said air circulation alternately.
4. Refrigerator according to claim 3, characterized in that it provides that at least one part (10) of said compartment (2) at a temperature higher than the freezer (1) reaches a temperature of + 3°C.
5. Refrigerator according to claim 2, characterized in that it provides a second compartment (50) at a temperature higher than the freezer that is controlled so as to operate at a temperature of + 3°C.
6. Refrigerator according to claim 1, characterized in that said at least one small size compartment (16) is housed inside said at least one freezer compartment (2).
7. Refrigerator according to claim 1, characterized in that said at least one small size compartment (16) is housed inside said at least one compartment (2) at a temperature higher than the freezer (1).
8. Refrigerator according to claim 1, characterized in that it provides for outlet ducts (22, 23, 24; 22, 23, 24, 40; 22, 23, 24, 53) for the outflow of the air from said compartments (1, 2, 16; 1, 2, 16, 50) and at least one duct (25) that conveys the air toward said evaporator (7) so as to facilitate its defrosting after the stopping of said compressor (9).



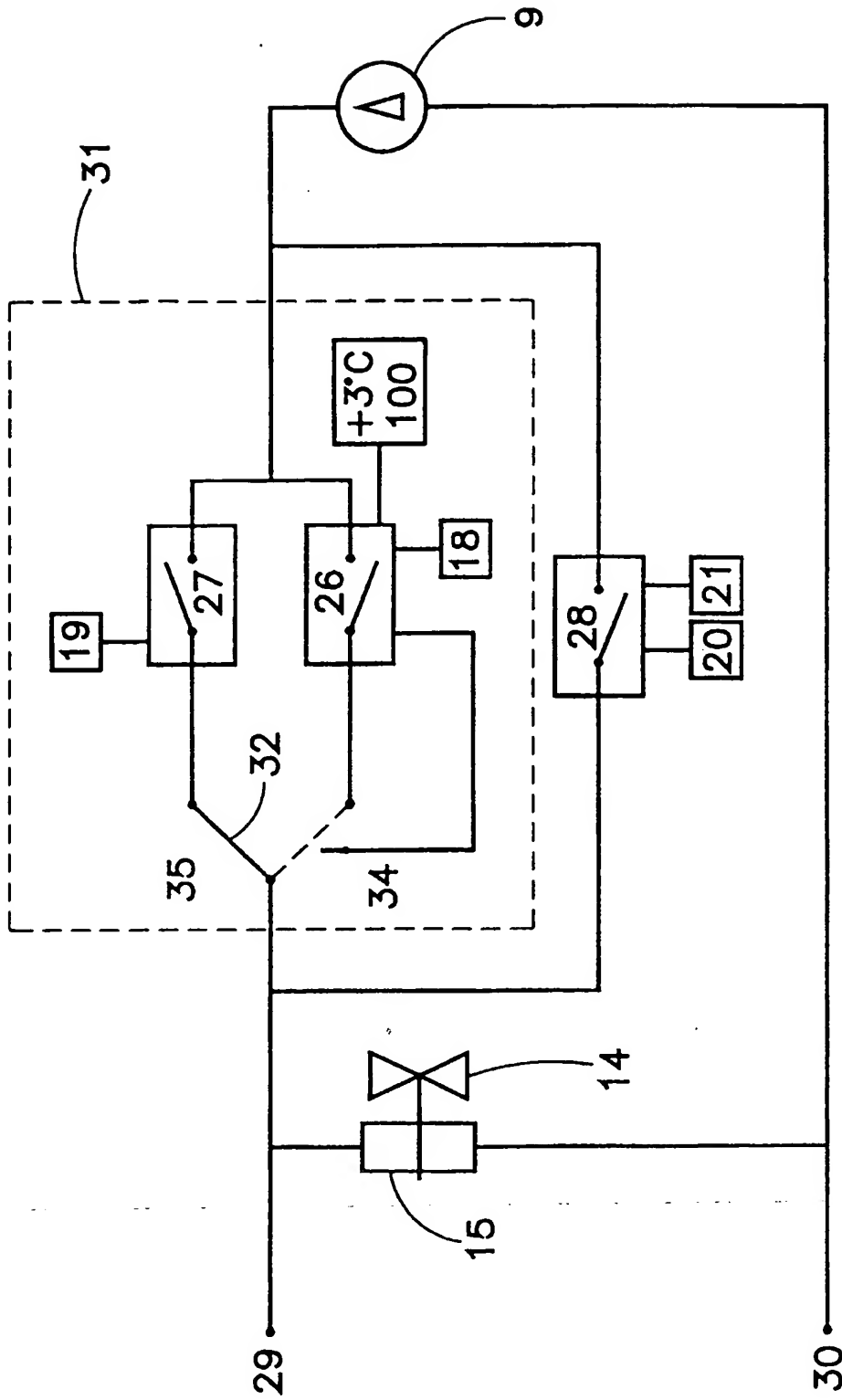
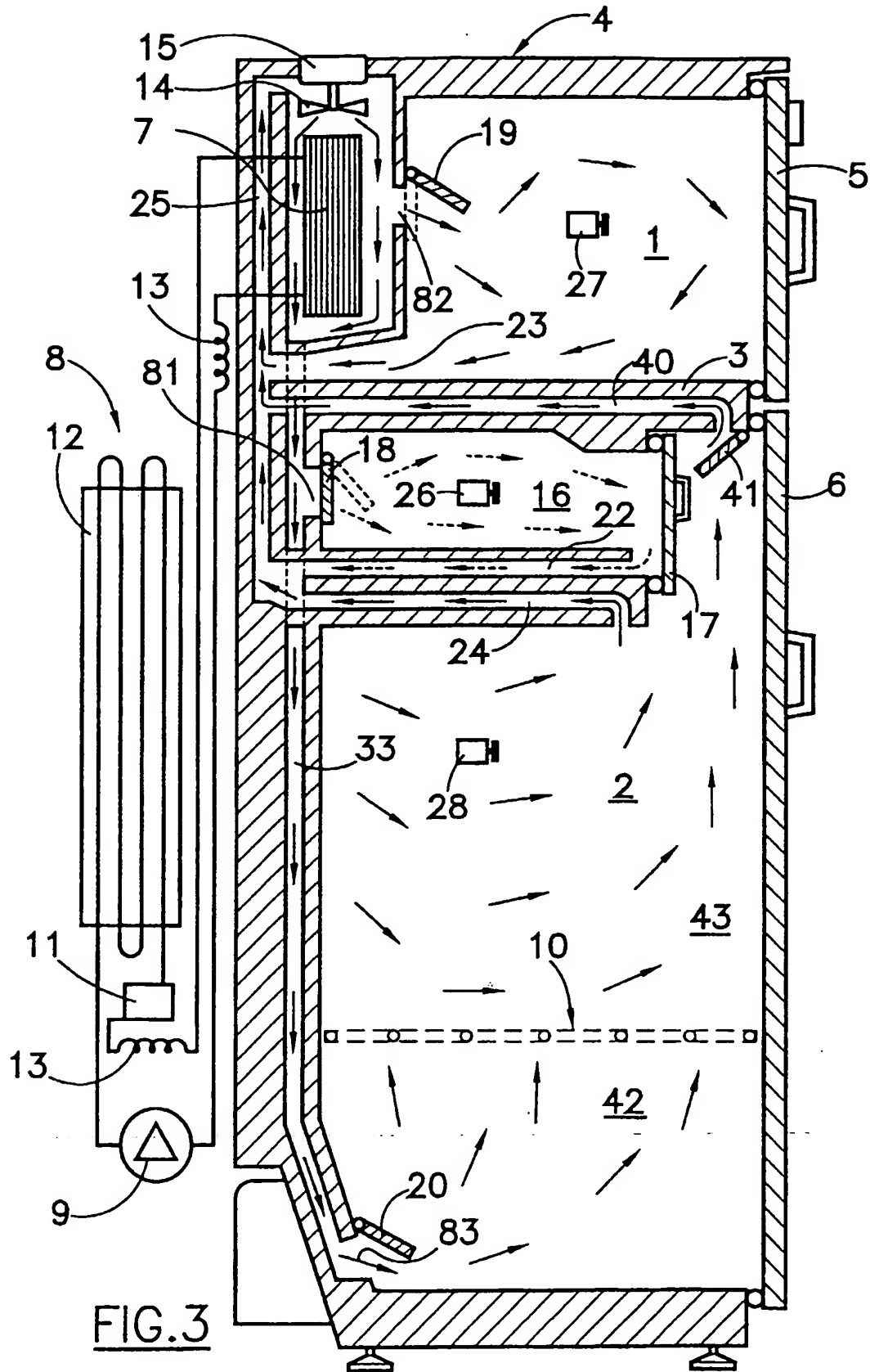
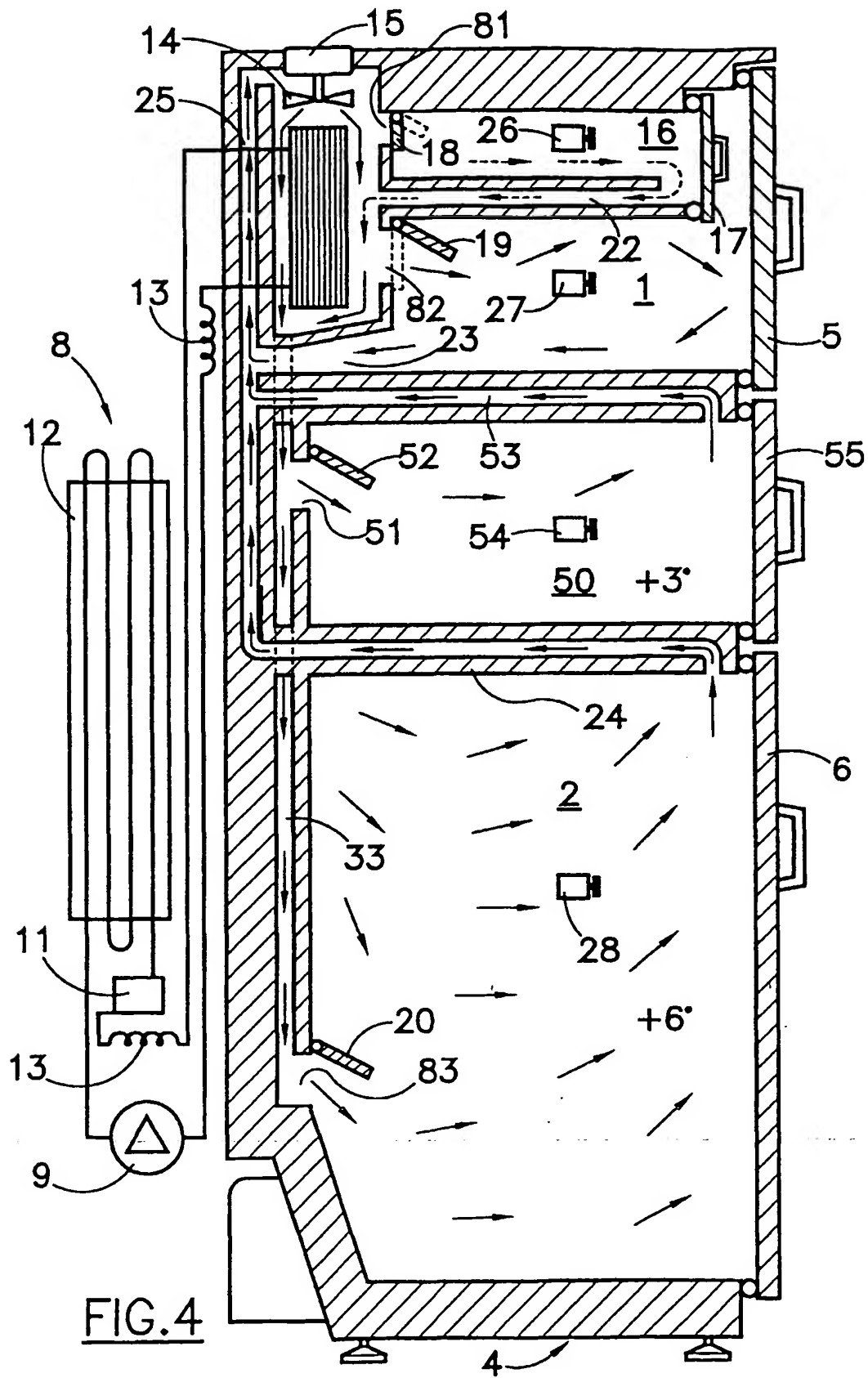


FIG. 2









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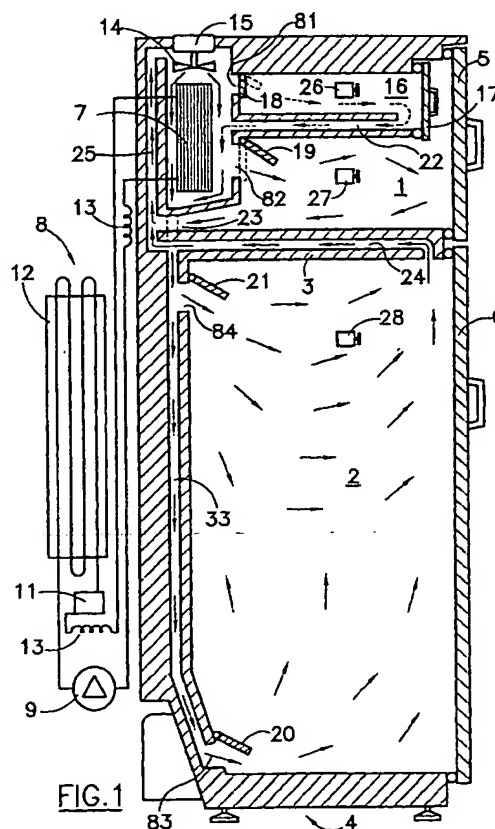
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(30) Priority: **05.08.1999 IT MI991771**

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# EUROPEAN SEARCH REPORT

Application Number  
EP 00 20 2389

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